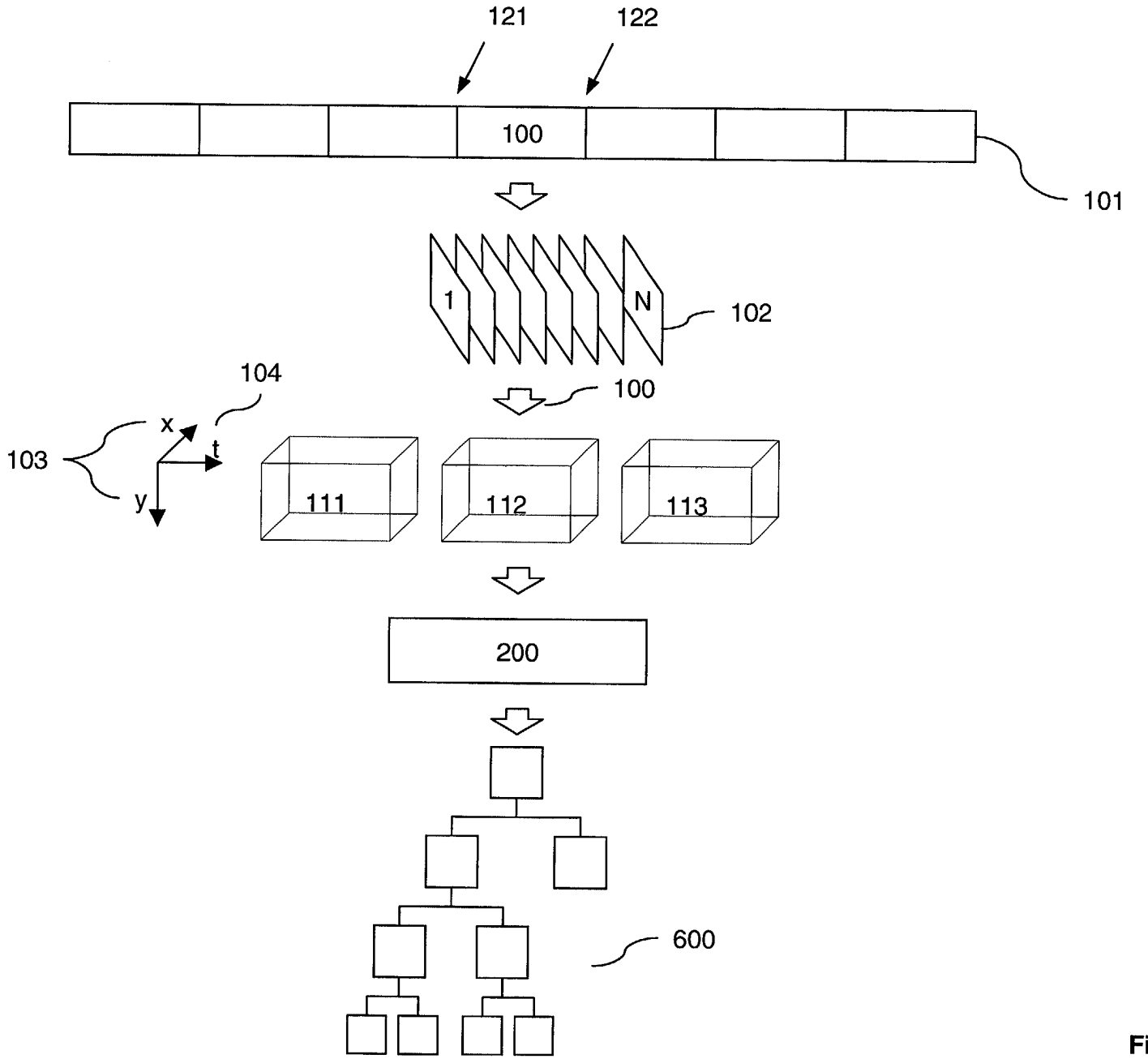

Figure 1

TOMOMO EES92860

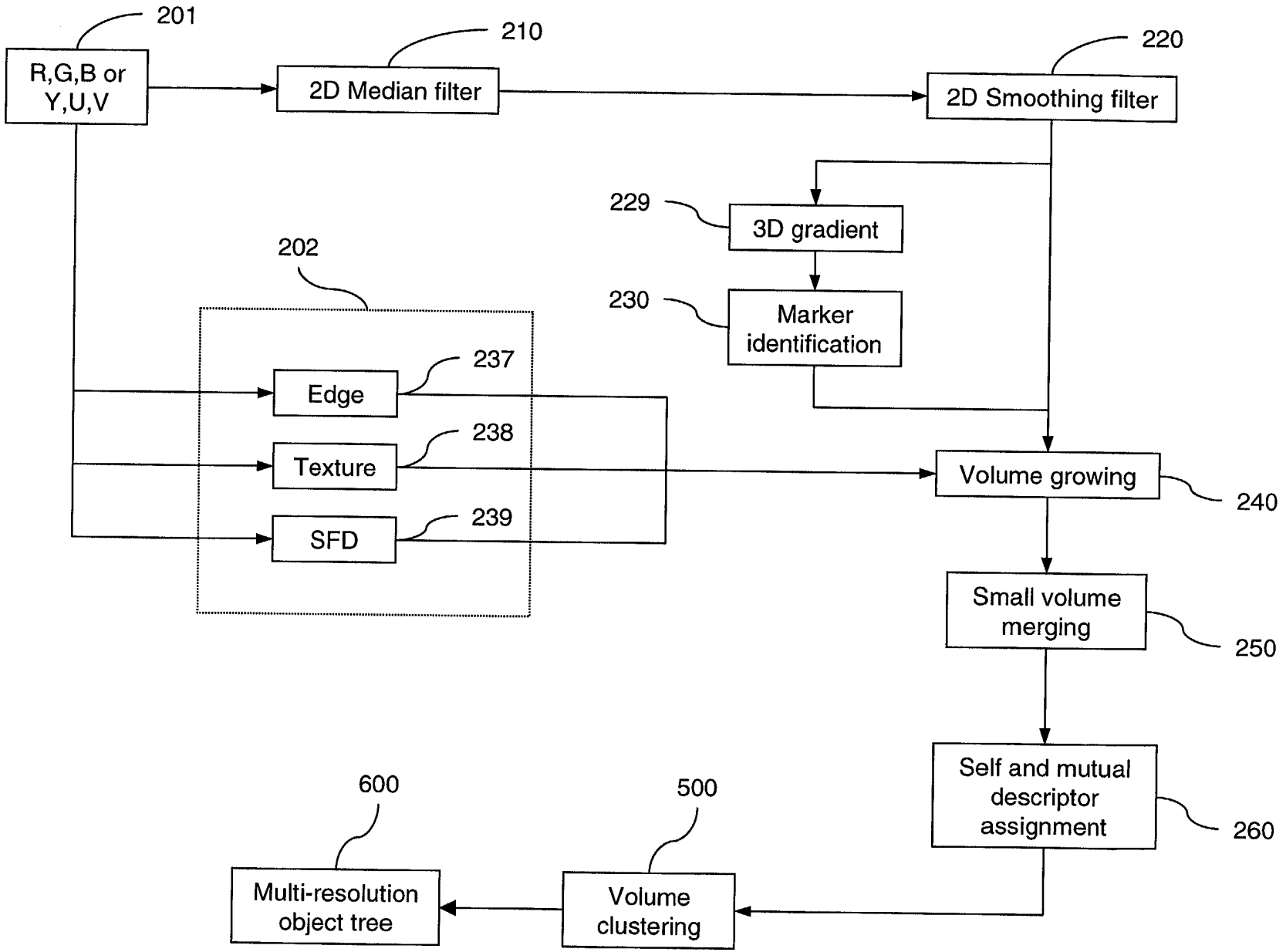

Figure 2

300

Color mean *(i.e. red)*	$F_1(P_i)$	$\frac{1}{N_i}\sum_{p_k \in P_i} R(p_k)$	301
Volume	$F_2(P_i)$	$\bigcup p_k, \quad p_k \in P_i$	302
Surface	$F_3(P_i)$	$\sum p_k \cap p_l$ $p_k \in P_i, p_l \in P_j, i \neq j$	303
Compactness – 1	$F_4(P_i)$	$F_2(P_i)/surface^2$	304
Compactness – 2	$F_5(P_i)$	$F_2(P_i)/maxcord^2$	305
Vertical motion	$F_6(P_i)$	$x_{first,i} - x_{last,i}$	306
Horizontal motion	$F_7(P_i)$	$y_{first,i} - y_{last,i}$	307
Route length	$F_8(P_i)$	$\sum_t \lvert T_i(t) - T_i(t-1) \rvert$	308
Average x position	$F_9(P_i)$	$\frac{1}{N_i}\sum_{p_k \in P_i} x$	309
Average y position	$F_{10}(P_i)$	$\frac{1}{N_i}\sum_{p_k \in P_i} y$	310

Figure 3

400

Average distance	$F_{11}(P_i, P_j)$	$\frac{1}{N_i \cap N_j} \sum_t \Delta d_{ij}(t)$
Variance of distance	$F_{12}(P_i, P_j)$	$\frac{1}{N_i \cap N_j} \sum_t \left(\Delta d_{ij}(t) - F_{11}(P_i, P_j)\right)^2$
Maximum distance	$F_{13}(P_i, P_j)$	$\max \Delta d_{ij}(t)$
Average change in distance	$F_{14}(P_i, P_j)$	$\frac{1}{N_i \cap N_j} \sum_t \left\lvert \frac{\partial \Delta d_{ij}(t)}{\partial t} \right\rvert$
Direction difference	$F_{15}(P_i, P_j)$	$\left\lVert T_i(1) - T_i(N_i) \right\rvert - \left\lvert T_j(1) - T_j(N_j) \right\rVert$
Compactness ratio	$F_{16}(P_i, P_j)$	$F_4(P_i \cup P_j) / F_4(P_i)$
Mutual boundary	$F_{17}(P_i, P_j)$	$F_3(P_i) + F_3(P_i) - F_3(P_i \cup P_j)$
Mutual volume	$F_{18}(P_i, P_j)$	$F_2(P_i) + F_2(P_i)$
Color difference	$F_{19}(P_i, P_j)$	$\left\lvert F_1(P_i) - F_1(P_j) \right\rvert$
Coexistence	$F_{20}(P_i, P_j)$	$\sum_t i_t \wedge j_t \quad \begin{cases} T_i(t) > 0 \Rightarrow i_t = 1 \\ T_j(t) > 0 \Rightarrow j_t = 1 \end{cases}$

411
412
413
414
415
416
417
418
419
420

Figure 4

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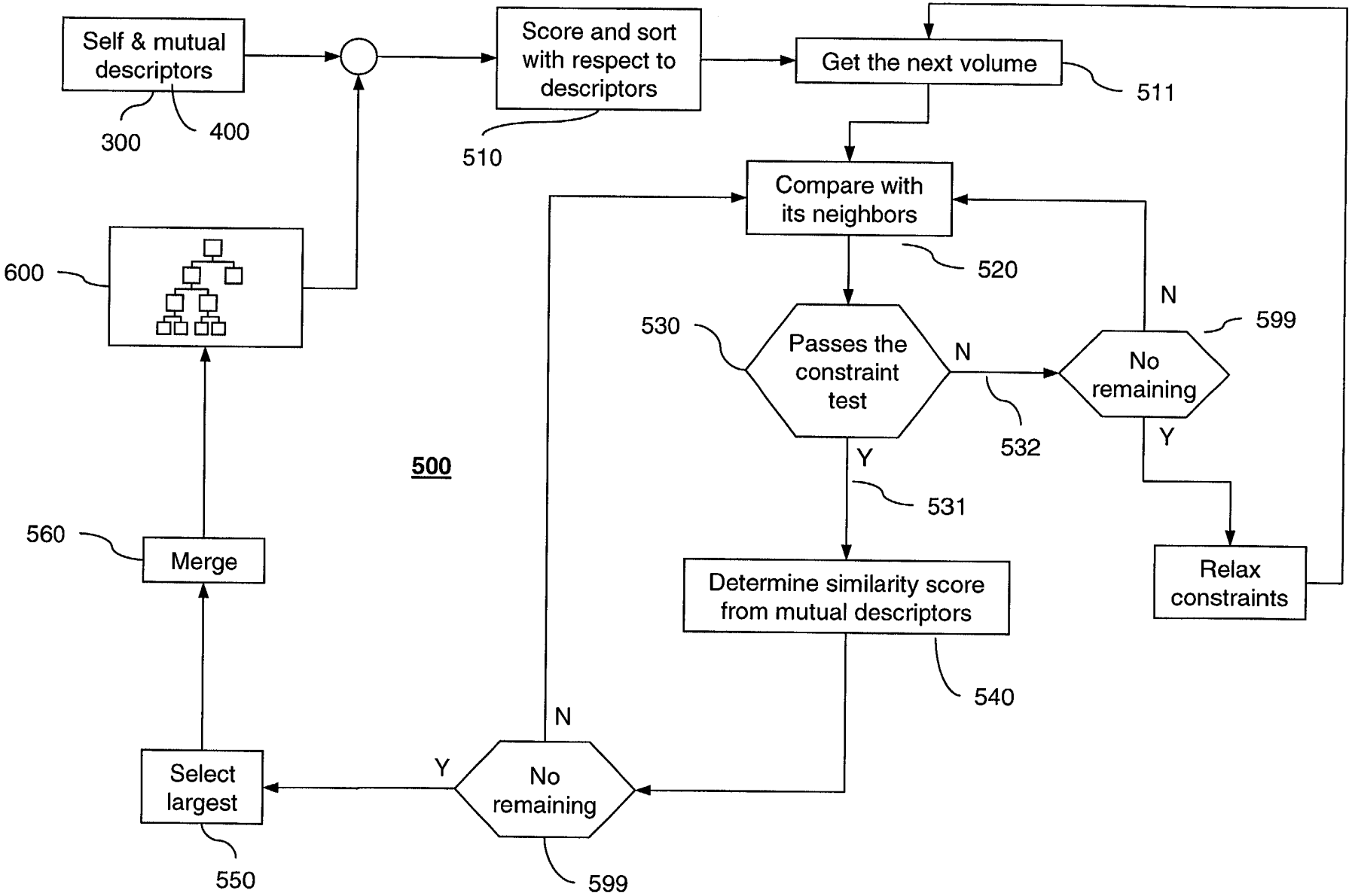


Figure 5

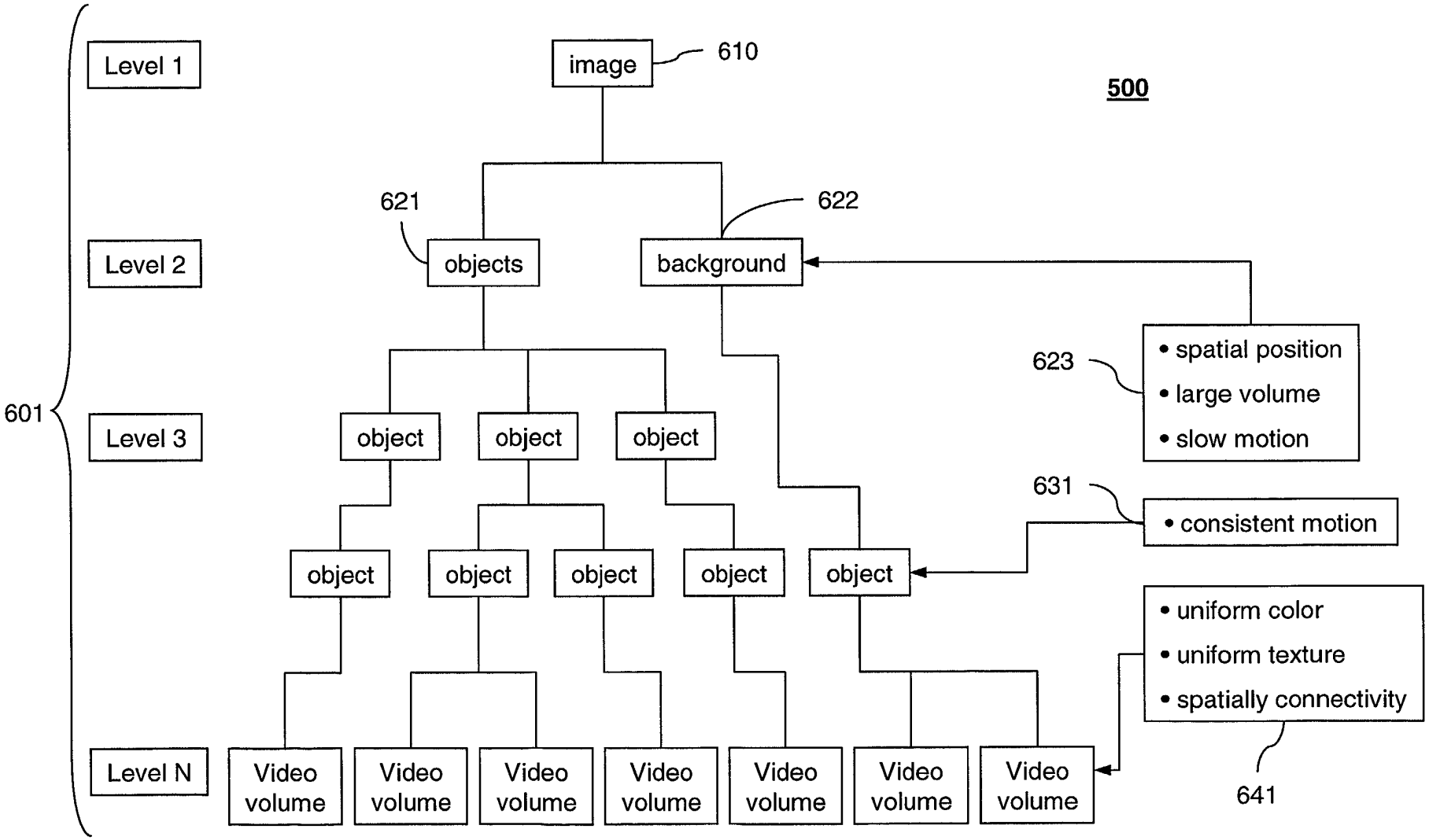

Level 1
Level 2
Level 3
Level N
601
image
610
500
621
622
objects
background
623
• spatial position
• large volume
• slow motion
631
• consistent motion
object
Video volume
• uniform color
• uniform texture
• spatially connectivity
641

Figure 6

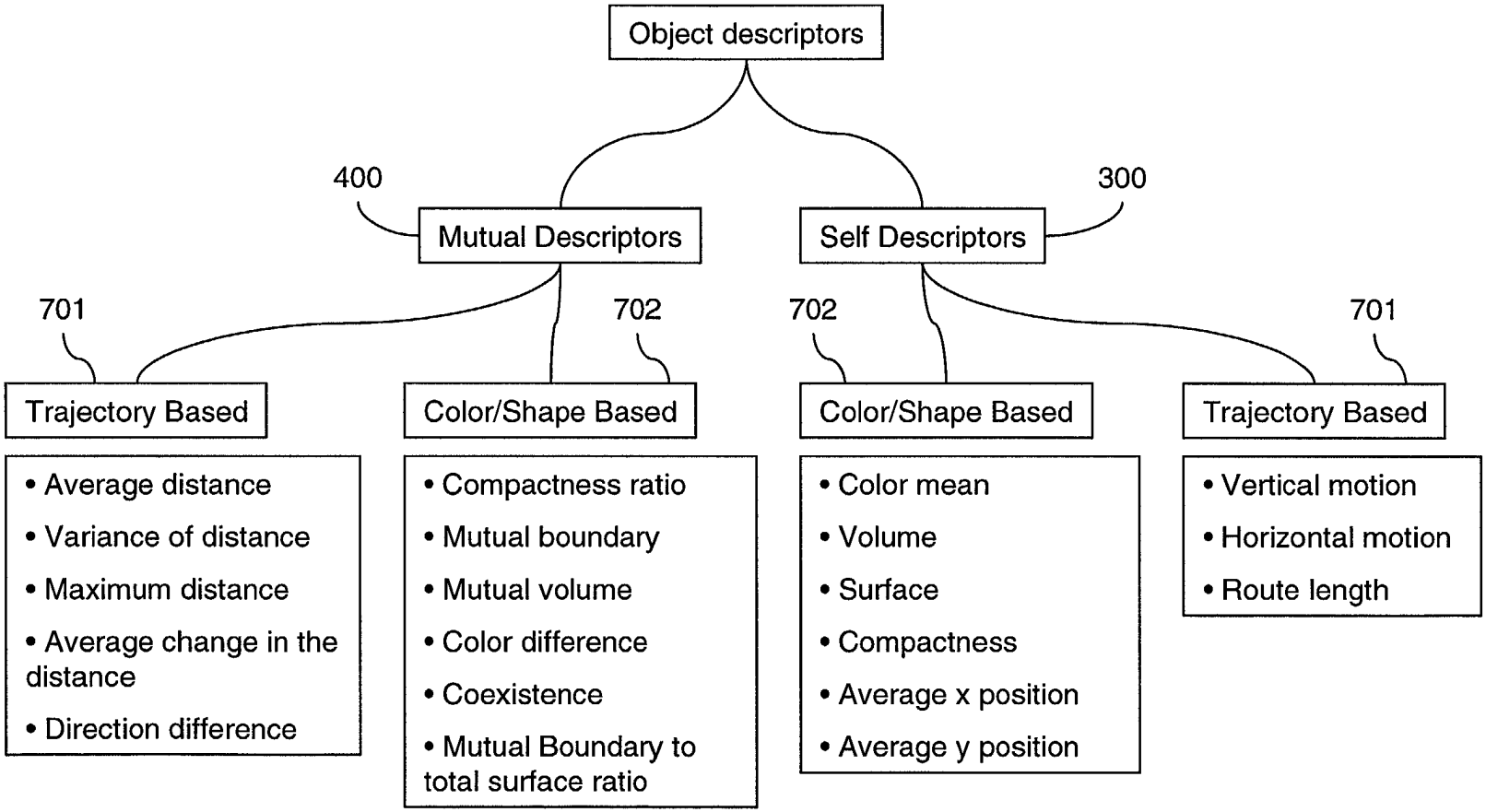

Object descriptors
400
Mutual Descriptors
300
Self Descriptors
701
Trajectory Based
• Average distance
• Variance of distance
• Maximum distance
• Average change in the distance
• Direction difference
702
Color/Shape Based
• Compactness ratio
• Mutual boundary
• Mutual volume
• Color difference
• Coexistence
• Mutual Boundary to total surface ratio
702
Color/Shape Based
• Color mean
• Volume
• Surface
• Compactness
• Average x position
• Average y position
701
Trajectory Based
• Vertical motion
• Horizontal motion
• Route length

Figure 7

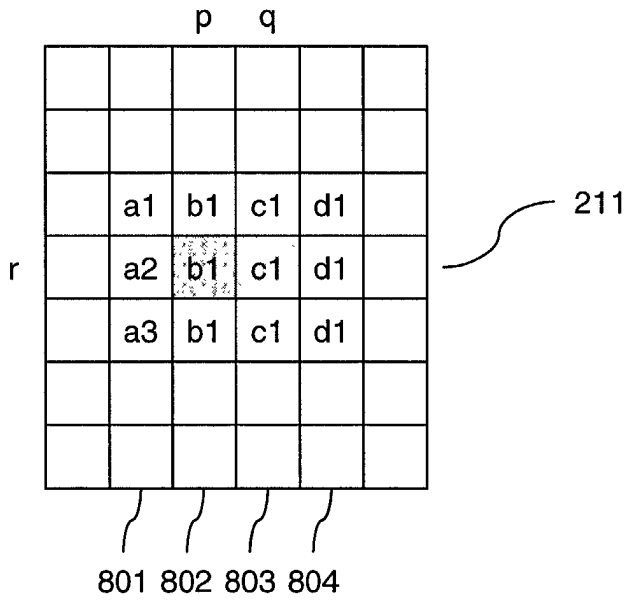
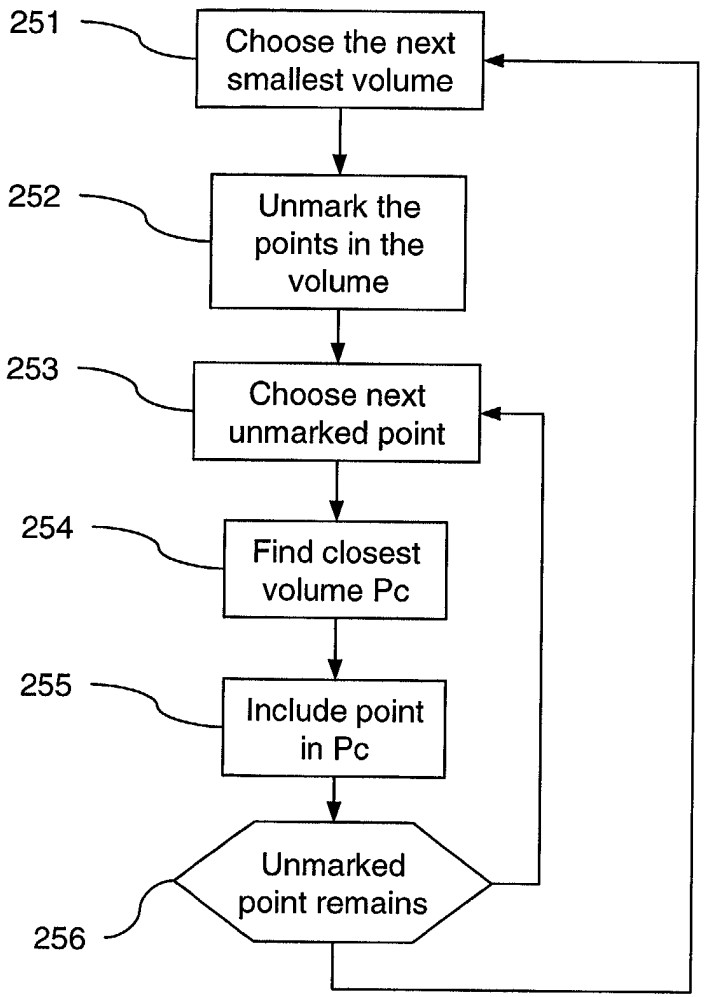


Figure 8


251
Choose the next smallest volume
252
Unmark the points in the volume
253
Choose next unmarked point
254
Find closest volume Pc
255
Include point in Pc
Unmarked point remains
256

250

Figure 9